

REMARKS

Claims 12, 13 and 16 have been canceled. Claims 1-11, 14, 15 and 17-31 are active in the present application. Reconsideration is respectfully requested.

The present invention relates to a polymerizable, solid aliphatic polyurethane that contains olefinically unsaturated double bonds.

Claim Amendments

Claim 1 has been amended by incorporating the limitations of Claims 12 and 13 therein, thus effectively limiting the claim to polymerizable, solid aliphatic polyurethanes containing olefinically unsaturated double bonds that have been prepared by one of the two process embodiments of original Claims 12 and 13. Claims 12 and 13 have been canceled.

Invention

The present invention is directed to a polymerizable solid aliphatic polyurethane containing one or more olefinically unsaturated double bonds. The polyurethane contains olefinically unsaturated double bonds and has a very narrow melting range within the temperature range from 40 to 200°C. The polyurethane is prepared by one of two processes (A) or (B) by:

(A) (i) reacting at least one linear aliphatic diisocyanate A) with at least one olefinically unsaturated compound C) in a molar ratio A):C) of 1:1 to give an adduct A/C) containing one isocyanate group and one olefinically unsaturated group, and then

(ii) reacting the adduct A/C) with at least one aliphatic compound B) containing at least two isocyanate-reactive functional groups and/or water in a molar ratio A/C):B) of x:1, wherein x is the number of the isocyanate-reactive groups in the at least one compound B), to give the aliphatic polyurethane, or

(B) (i) reacting at least one linear aliphatic diisocyanate A) with at least one aliphatic compound B) containing at least two isocyanate-reactive functional groups and/or water one compound B) in a molar ratio A):B) of x:1, wherein x is the number of the isocyanate-reactive groups in the at least one compound B) to give the adduct A/B) containing x isocyanate groups, and then

(ii) reacting the adduct A/B) is reacted with at least one olefinically unsaturated compound C) containing an isocyanate-reactive functional group in a molar ratio C):A/B) of x:1, wherein x is the number of the isocyanate groups in the adduct A/B) to give the aliphatic polyurethane.

The polymerizable solid aliphatic polyurethane containing one or more olefinically unsaturated double bonds of the invention is characterized by having a very desirable narrow melting point range within the range of 40 to 200° C that can be used as a powder coating material or for preparing powder coating materials which give weathering-stable and non-yellowing coatings.

Prior Art Rejection

Claims 1-6, 8-12, 14-19, 21-23 and 26-31 stand rejected based on 35 USC 102(a) or 35 USC 103(a) as anticipated by or rendered obvious over Bayards WO 99/14254. This ground of rejection is respectfully traversed.

The Bayards reference discloses a radiation-curable binder composition for powder paint formulations that is said to be formulated from a combination of a polymer having specified unsaturation and a crosslinker. In this connection, Experiment 3 (referred to specifically by the Examiner) of the reference discloses the preparation of a crystalline prepolymer that functions as the cross-linker component of the combination. The crosslinker is prepared by reacting ethylene glycol and dodecanedicarboxylic acid with 1,6-hexamethylene diisocyanate and hydroxybutylvinyl ether. In this reaction, rather than a polyurethane being prepared as required in present Claim 1, the polymer prepared in the reference is a polyester that is formed by the reaction primarily of ethylene glycol and dodecanedicarboxylic acid in which the mole ratio of ethylene glycol to dodecanedicarboxylic acid is about 2:1. In fact, in view of the excess of ethylene glycol it is likely that the prepolymer is probably hydroxy-terminated. In the reaction of preparing the polyester, 0.26 moles of hexamethylene diisocyanate and 0.25 moles of hydroxybutyl vinyl ether are present. On the other hand, in the present invention a polyurethane is prepared, not a polyester, under precise conditions, wherein in one embodiment at least one diisocyanate is reacted with at least one olefinically unsaturated compound containing a functional group that reacts with an isocyanate group at a mole ratio of 1:1 to give an adduct that contains one

isocyanate group and one olefinically unsaturated group, and then reacting the adduct with at least one aliphatic compound that contains at least two isocyanate-reactive functional groups and/or water under the condition of mole ratio of the compound with the adduct of x:1. In the other embodiment, the polyurethane is prepared by reacting at least one diisocyanate with at least one aliphatic compound that contains at least two isocyanate-reactive functional groups and/or water in a mole ratio of x:1 to form an adduct which is then reacted with at least one olefinically unsaturated compound containing a functional group that reacts with an isocyanate group. There is no description anywhere in the reference of the process embodiments of the invention as claimed, and therefore the anticipatory ground of rejection is obviated. Moreover, there is no suggestion in the reference of a process of preparing a polyurethane that meets the conditions of the present claim 1, wherein the polyurethane contains double bonds. In this regard it is noted that the crosslinkers of Experiments 1-3 are all polyesters, not polyurethanes, and in the descriptions of these experiments, as well as in the text of the reference, there is no teaching or suggestion of the limitations found in present Claim 1, as amended, of the precise reaction conditions of reacting three components to prepare the polyurethane product. Accordingly, the obviousness ground of rejection is believed obviated and withdrawal of the rejection is respectfully requested.

Claims 7, 13, 24 and 25 stand rejected based on 35 USC 103(a) as obvious over Bayards WO 99/14254 in view of Hall WO '332. This ground of rejection is respectfully traversed.

Although it is clear from the description of the Hall reference of the paragraph bridging pages 2 and 3 that a powdered ethylenically unsaturated material having a melting point of about 60° to 120° C is prepared by reacting a polyisocyanate with an at least stoichiometric amount of an alcoholic component comprising at least a monovalent alcohol, a portion of which possesses ethylenic unsaturation derived from acrylic acid or methacrylic acid and optionally at least a monomeric polyol, nevertheless, the reference does not provide any teaching of the amounts of reactants employed, and certainly contains no disclosure of the specific limitations of present Claim 1. In fact, when calculating the amounts of reactants employed in the examples of the reference, it is clear that the products obtained do not correspond to the polyurethane of the present invention. Thus, the Hall reference does not overcome or improve upon the deficiencies of the Bayards reference. Accordingly, withdrawal of the obviousness ground of rejection is respectfully requested.

Claim 20 stands rejected based on 35 USC 103(a) as obvious over Bayards WO 99/14254 in view of Sacharski et al. This ground of rejection is respectfully traversed.

Claim 20 is directed to a secondary feature of the invention is which the form of the coating material of Claim 17 containing the polyurethane of present Claim 1 is in the form of a slurry coating material. This is an aspect of the invention upon which patentability does not depend. Moreover, since the combination of the two references does not suggest the claimed polyurethane of the invention, it is clear that because the subject matter of Claim 20 is ultimately dependent on Claim 1, Claim 20 is therefore patentable over the disclosures of the references and withdrawal of the obviousness ground of rejection is respectfully requested.

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It is now believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "F.O. Oblon", with a long horizontal flourish extending to the right.

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